Soil-Climate Monitoring

USDA - Natural Resources Conservation Service (NRCS)
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CONCEPT

The NRCS is developing a comprehensive nationwide soil moisture and climate information system: SCAN (Soil Climate Analysis Network). The program objectives are to support natural resource assessments and conservation activities in the 21st century. SCAN will focus on the agricultural areas of the United States and, when fully funded, will integrate existing cooperator networks and add 1,000 or more new remote sites to develop the first nationwide soil-climate network.

The USDA-NRCS through SCAN will:

- Integrate information from existing soil-climate data networks and
- Establish new data collection points through partnerships with federal, state, local, and tribal entities.

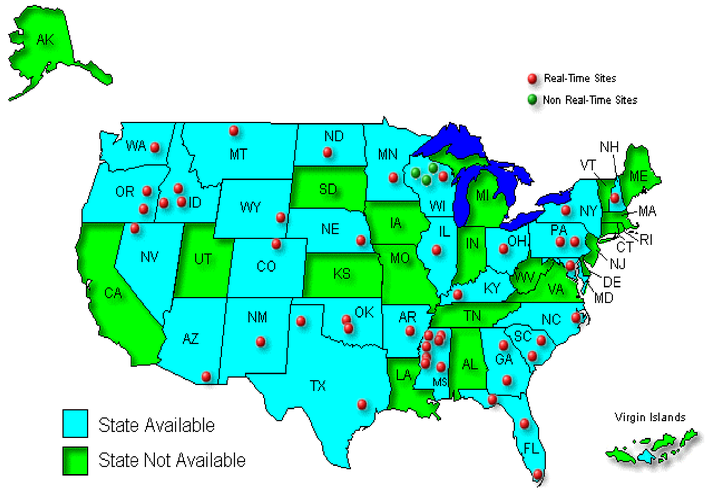
BACKGROUND

The ability of NRCS and its partners to make sound resource assessments and watershed decisions has been severely limited by the lack of quality, historic, and real-time soil-climate information. Existing data from other networks are essentially inadequate for most purposes, as they tend to be application-specific, short-term, incomplete, limited in area of coverage, and often include non-standard data that are difficult to access.

The NRCS has operated a national Soil Moisture / Soil Temperature (SM/ST) Pilot Project since 1991. Significant knowledge and experience have been gained in the type of sensors used, maintenance, network operation, quality control, product analysis, and dissemination of information to users.

SCAN will use this experience to build, operate, and maintain a network of soil climate monitoring stations and to develop products that our customers require in order to make sound resource management decisions.

CURRENT LOCATIONS



USES OF SCAN DATA

National resource management issues for which long-term soil/climate information is needed include:

- Monitoring drought development, extent , and severity.
- Planning and decision making inputs regarding drought.
- Soil classification.
- Global climate change.
- Engineering applications.

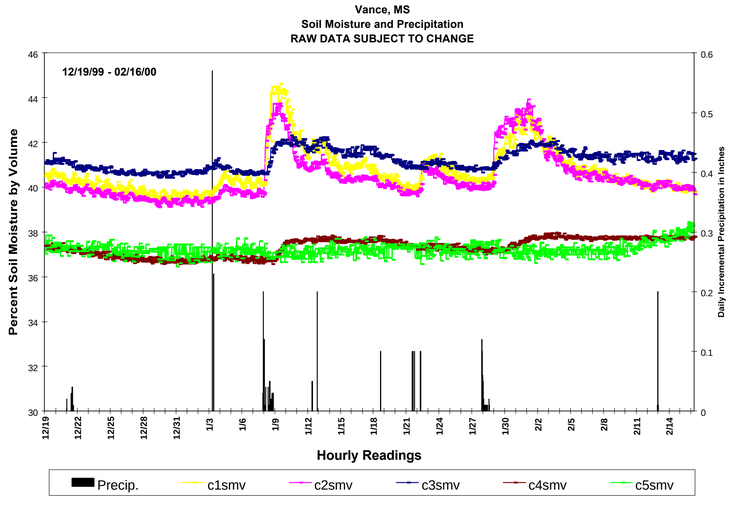
USES OF SCAN DATA, cont.

- Input to global circulation models.
- Development of new soil moisture accounting and risk assessments.
- Monitoring and predicting changes in crop, range, and woodland productivity in relation to soil moisture-temperature changes.
- Prediction of regional shifts in irrigation water requirements which may affect reservoir construction and ground water levels.
- Predicting shifts in wetlands.
- Predicting changes in runoff that affect flooding and flood control structures.
- Verification and calibration of aircraft and satellite platform remote sensing instrumentation.
- Verification and calibration of soil moisture models.
- To predict the long-term sustainability of cropping systems, and watershed health.

STANDARD SCAN SITE CONFIGURATION

Parameter Measured	Description
Precipitation	Storage type gage
Air Temperature	Collected by a shielded thermister
Relative Humidity	Collected by a thin film capacitance-type sensor
Wind Speed & Direction	Collected by a propeller type anemometer
Solar Radiation	Collected by a pyranometer
Barometric Pressure	Measured by a silicon capacitive pressure sensor
Snow Water Content	Measured using a snow pillow device and a pressure transducer
Snow Depth	Measurement is by a sonic sensor
Soil Moisture	Collected by a dielectric constant measuring device. Typical measurements are at 2", 4", 8", 20", and 40" where possible
Soil Temperature	Collected by an encapsulated thermistor. Typical measurements are at 2", 4", 8", 20", and 40" where possible.

All above ground sensors are reported hourly but read every 10 seconds. The soil moisture and temperature sensors are read once per hour.

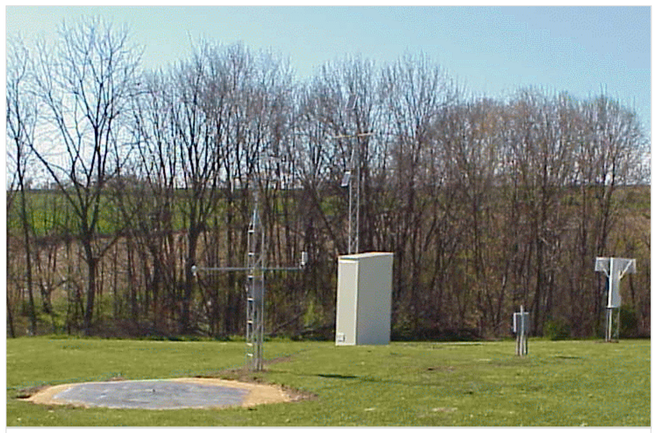


DATA MANAGEMENT

Quality control is performed in two stages. The computer automatically validates incoming values against limits and flags any that fall outside preset windows. A statistical assistant examines any flagged values to determine their accuracy and makes corrections. All parameters are graphed and comparisons are made between sensors to verify that the data are within an acceptable range.

DATA ACCESS

Beginning in May 1998 data were placed on the NWCC homepage at http://www.wcc.nrcs.usda.gov. The web site contains the current and historic data for each site. In addition to the data, each site contains all of the soil pedon information, a site picture, and a "hot link" to the National Soil Survey Center Laboratory database, which contains all of the site characterization (chemical, physical, and mineralogical) information. Other Soil Moisture Team projects data are also available through this web site. Interest has grown dramatically since the data were made available on the internet.



Mahantango Creek, Kilingerstown, PA

OTHER SOIL-CLIMATE PROJECTS

The Soil Temperature and Moisture Team (STMT) manages more than a dozen projects consisting of more than 100 soil-climate monitoring stations in 25 states and the U.S. Virgin Islands. Many of the projects are cooperative ventures with other government agencies and universities and are designed to expand the area of coverage. Part of this expanded coverage includes global climate change projects in Antarctica and on the Tibet plateau in China. The data from some stations are not yet on-line at the NWCC homepage, but plans are to have all collected data available through the internet.